

Nova Notes

The Newsletter of the Halifax Centre of the Royal Astronomical Society of Canada



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SPECIAL ISSUE: VIEWING THE UNIVERSE IN A DIFFERENT WAY

Dave Chapman's Lunatic

Ramblings 3: Big and Small

Matt Paine's The Universe's

Symphony of Sound: Those
Loud Leonid Meteors

Art Cole's Starlight and
Semiconductors: What is a
Picture Worth?

**Mike Boschat's Experience as a
Radio Astronomer**

September Meeting: What
We Did This Summer

Member Profile:
Tim Doucette

St. Croix Observatory

Part of your membership in the Halifax RASC includes access to our observatory, located in the community of St. Croix, N.S.. The site has expanded over the last few years and includes a roll-off roof observatory with electrical outlets, use of the Centre's new Go-To 400-mm Dobsonian telescope and 100-mm binoculars, a warm-room, and washroom facilities.

Enjoy dark pristine skies far away from city lights and the company of like minded observers searching out those faint "fuzzies" in the night. Observing nights (Fridays close to the New Moon or Saturday backup) are open to both members and their guests. If you are not a key holder and would like to become one, or need more information, please contact the SCO Manager, Alex LeCreux (for contact info, see below).

Upcoming Observing Nights:

November 13th backup 14th

December 11th backup 12th

Meetings usually begin at 7:30 p.m. at Saint Mary's

University in Room 101 of the Atrium Building (AT).

All meeting locations and presentations subject to change

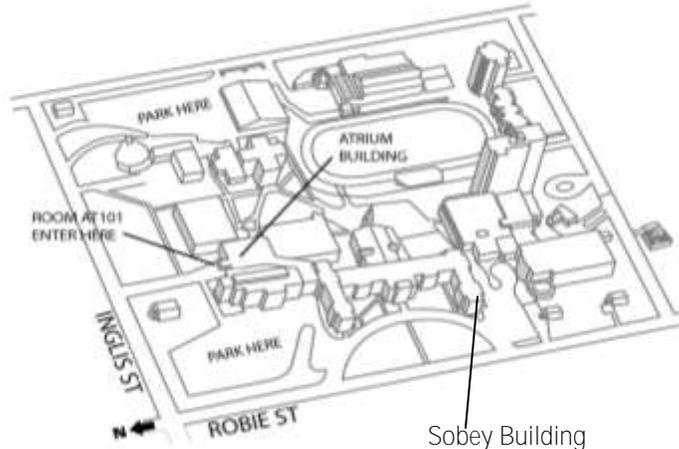
November 20, 2015, Sobey Building SB255 TBA

December 11, 2015 TBA

Meeting Location: Saint Mary's University

Atrium Building (AT)
Room AT 101

The Atrium is located in front of the Patrick Power Library, between the Burke Building and Science Building.



Meetings are usually held on the third Friday of the month, except for the months of July and August, when there are no meetings.

Executive meetings begin at 6:30 p.m., usually in room AT 306, and all members are welcome.

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In this issue:

Meeting Announcements	2
From the Editor	3
Cover Photo	3
Universe's Symphony of Sound	4
So you want to hear meteors? A basic how to guide	5/7
Lunatic Ramblings 3	8
Member Profile: Tim Doucette	9
Starlight and Semiconductors	10/11
September Meeting Report	12

Cover Photo

The cover photo of Jupiter, Venus and Mars taken by Michael Boschat who is into more than radio astronomy. Photos taken October 27, 2015. Canon XSi on a tripod. Lens set at 140mm, f/4.5, 800 ISO and a 4 second exposure.

From the editor *Tony Schellinck*

The standard image we have of viewing the night sky is of someone looking through the telescope on a cloudless, moonless night. This Nova Notes issue is all about viewing the universe in different ways. It features two articles on radio astronomy. When the clouds obscure astronomical events such as the Leonids, one can still hear the event if they cannot see it. Michael Boschat submitted an article on his experiences as a radio astronomer and Matt Paine wrote a complementary article describing his experience listening to the Leonids as part of his column on radio astronomy. Together they encourage us to listen as well as view the night sky.

This issue member profile features Tim Doucette of Quinan Nova Scotia (24 minutes from Yarmouth). Tim has built an observatory there designed for public outreach and has been involved in reducing light pollution in his local communities. But he views the sky differently than anyone else, being able to see ultraviolet light in the night sky. He thus is fortunate enough to see features of DSO's that no one else can see.

Art Cole's column "Starlight and Semiconductors: What is a Picture Worth?" is about two historic photographs that dared to look at the universe differently. Earth's pale blue dot is the photo taken of the Earth from far out in the Solar system by Voyager 1 as requested by Carl Sagan. The Hubble's Deep Field Image, taken despite opposition from colleagues by Bob Williams, the director of the Space Telescope Science Institute, discovered thousands of galaxies where nothing had been seen before.

Dave Chapman's column describes another area on the moon where you can find treasures to view. While many young astronomers are keen to see deep sky objects, they may not appreciate the many fascinating features there are to be seen on the moon. Dave's column shows us there is excellent viewing even on a moonlit night.

At the September meeting we had several presentations. Paul Gray showed images of a dark sky he shared with his family while camping at Kejimkujik this summer. No telescope was involved or was necessary to appreciate the beauty of the night sky. Jerry Black also showed us the incredible time lapse images one can capture of the night sky with just a tripod and camera. I talked about my binocular table that I use at public outreach events such as the Keji Dark Sky weekend, Nova East, the Halifax Planetarium, the show at the Astor theatre in Liverpool and in the play I put on at Hal-Con this year. I myself have recently discovered the joys and advantages of viewing the night sky through binoculars and have become somewhat of a missionary, trying to convince the public that those binoculars collecting dust in their cupboards are all they need to turn a starlit night into a night of discovery.

If our goal as a society is to encourage more people to take an interest in astronomy then we need to let them know that the purchase of a telescope is not the start of that journey, nor is it even necessary. As illustrated in this issue, there are many ways to enjoy and study the night and day sky. When pursuing that passion you may even discover something special about yourself, some strength of character or ability you didn't know you had, for in the end, it is really a journey of self discovery.

Nova Notes: The Newsletter of the Halifax Centre of the RASC

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Nova Notes is published five times a year, in February, April, June/July, September/October and December.

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The opinions expressed herein are not necessarily those of the Halifax Centre.

Articles on any aspect of Astronomy and Allied Sciences will be considered for publication.

The Universe's Symphony of Sound: Those Loud Leonid Meteors

Matt Paine

So you're probably wondering what happened to Part II of my article IT'S BIG, IT'S BRIGHT, AND IT'S LOUD. Over the last 6-8 weeks the Sun has been acting up and we have had several Corona Mass Ejections. As a result, the ionosphere and atmosphere has been constantly saturated with noise. This noise has been so loud and high, I cannot hear anything on my radio set-up. Combine that with the shorter and colder days, and it has made it tough for me to get out under the Sun with my radio astronomy gear.

Now that Fall is under way and we have made it through another great lunar eclipse this past September, the next big meteor event the Leonids is approaching in November. This year the peak of the Leonids takes place on November 17-18, 2015. On years with clear skies, no Moon, and favorable weather, the meteor shower can be spectacular from a dark sky location. But on others years, the bright Moon or bad weather can spoil the greatness.

So where does amateur radio astronomy and the Leonid meteor shower come together—radio waves are not affected by moonlight or clouds. Back on November 14-17, 2013 the Leonid meteor shower occurred during a nearly full moon. I remember this because my birthday is November 14th. Visually, the meteor shower was difficult to see, except for the brightest of meteors. Using my amateur radio experience (I have been licensed since 2005) I realized I could listen to the meteor shower regardless of sky conditions. I found an old Sony shortwave receiver, the non-digital type with the internal filters, and got some 20 gauge copper wire from my brother who is an electrician. Any time you can get something for free is a good thing! Many of older shortwave receivers that were made in the 1980's and early 1990's had external antenna jacks. This allowed one to use his or her own antenna made out of wire versus using the telescopic built-in antenna. Those telescopic antenna are great for general listening, but terrible if you want to listen over a fairly wide range of frequencies. Making a wire dipole antenna similar to what fellow RASC – Halifax member Michael Boschat uses, allows better reception over the wider frequency range that you are

trying to hear meteors on.

I then fasten the home-made dipole antenna to the external antenna jack on the radio. This external antenna jack usually goes right to the radio receiver, bypassing any internal filtering the shortwave radio may have. This is good because you don't want any of the internal filters in the radio to block out any radio signal from the meteors.

The Leonids typically can be heard between frequencies 70 MHz (FM) through 83MHz (FM). A little tip is to avoid other FM radio stations in the vicinity on the station you chose to monitor the meteor shower. I live 35 miles southwest of Boston Massachusetts and 19 miles northeast of Providence Rhode Island. This area happens to be one of the most congested FM radio markets on the east coast of the United States, outside of metropolitan New York City. Otherwise, if you are too close to an FM broadcast station, that station will effectively mute out any 'radio-noise' you hear from the meteor streaking across the sky. Just ask Michael how many times he has battled close proximity FM radio

stations and FM Television stations in HRM when trying to listen in on meteor showers!

I then strung the wire dipole I built around the outside of the second floor window frame, placing the radio on the adjacent desk. I went to bed rising early in the morning as the peak of the shower occurred between 3AM and 5AM Eastern Standard Time. Then I turned on the radio and listened to the hissing and pooping sounds of the Leonids streaking across the sky.

So what do I want my fellow RASCals to take away from this article? I want people to understand that it does not matter if

you live in an HRM apartment like Michael or out in the rural parts of the province, radio astronomy can be as simple as a 30 dollar (USD) shortwave receiver and a piece of free wire. Go out and try some simple radio astronomy during one of the many meteor showers throughout the year (Meteor Shower information is in the Hand Book – ask Roy), you just may be surprised what you hear streaking across the sky.

Matt Paine

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RASC Halifax Centre



▲ A Leonid flashes through Orion and is picked up on Matt's radio telescope. (Photo: Ron Zincone)

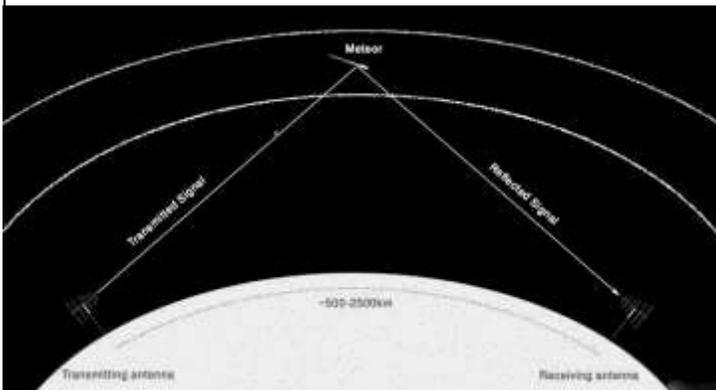
So you want to hear meteors? A basic how to guide

Michael Boschat

Well, it's overcast as usual and the big Perseid meteor shower is expected to produce 1000 meteors an hour. You were all ready with your camera to drive to a clear spot but everywhere is overcast. So, you can sit and watch TV or listen to this meteor shower and others as well. How do I do that? you ask... well it's pretty simple. I will describe how to do it in basic terms. I'm not an electronics expert but I will describe my way of listening to them.

The BASICS

We have all seen meteors flashing across the sky at night. They do the same in a daytime sky but we cannot see them with the eye, but we can hear and see them with radio methods. As the meteor burns up it leaves an ionized trail. It is from this trail that radio waves are reflected off, similar to a mirror reflecting light. A transmitter at a far distance, say 1000 Km, is broadcasting and one of the signals hits the ionized layer and gets reflected to you, where your radio will pick it up. See Figure 1 below.



▲ *Figure 1:* The FM signal is reflected off the ionized trail and is picked up by your radio receiver.

Back in the old days, TV stations used over the air transmissions (analogue) which we used to detect meteors and the signals were strong and all over the place, so meteor trails were reflecting a lot and we heard a lot. Enter technology, 90% of the nice analogue TV transmitters are now converted to digital. This saves money but produces less powerful transmissions. But they can still be used for our purposes.

GETTING STARTED - Radio, Antenna, Frequency

OK, what do I need to hear and "see" these meteors? Well, the main thing is a radio. Can I use my digital AM/FM one, well sort of, I will discuss that in brief later. A better type



▲ Michael's radio astronomy equipment (Photo: Michael Boschat)

radio is what Ham or Amateur Radio people use. Yes, they are expensive, but you do not need one that transmits, just one that receives, and has the following modes, CW (Carrier Wave) Lower Sideband (LSB), and Upper Sideband (USB). In most cases I always use CW mode.

I use a hand held ICOM R-20 receiver I bought for \$700. It has all the features needed. You can buy one (or another brand) from eBay, or check your newspaper or nowadays the internet want ads to look for one that you can afford. BUT--- you will need to watch what frequency they use. Some use only 144 MHz, you need one that will go from at least 50 MHz to 108 MHz. The other frequencies will not be needed as we will be working only from 50 Mhz to the 108 MHz, and mostly in the TV frequency range of 50-86 MHz. You really do not want to go above 108 MHz, as fewer meteors will be detected at the higher the frequencies.

You asked, "What about my digital FM radio?". OK, you can use it to some extent, but if you live in a city as I do you know how many FM stations there are walking over each other's signal. This is the big problem with trying to find FM radio meteors from a city. You may need to make or buy

some type of notch filter to eliminate the other stations from walking over a frequency you monitor.

The basics of FM radio meteor detection is to tune to a station frequency you know exists that you can either *just* hear or not hear. Now, you should have a clear static sound with very minimal noise in the background. When a meteor goes by the station will come in as either a brief period of talk or music. The longer the meteor trail, the longer the signal will last. The FM detection would work best away from the city and places like our mid Canadian Prairies with less population would be ideal. Of course getting away from the city would help also. One can always try with a radio to see what happens

especially during a meteor shower to give the best results and let you get the feel of what it all would sound like.

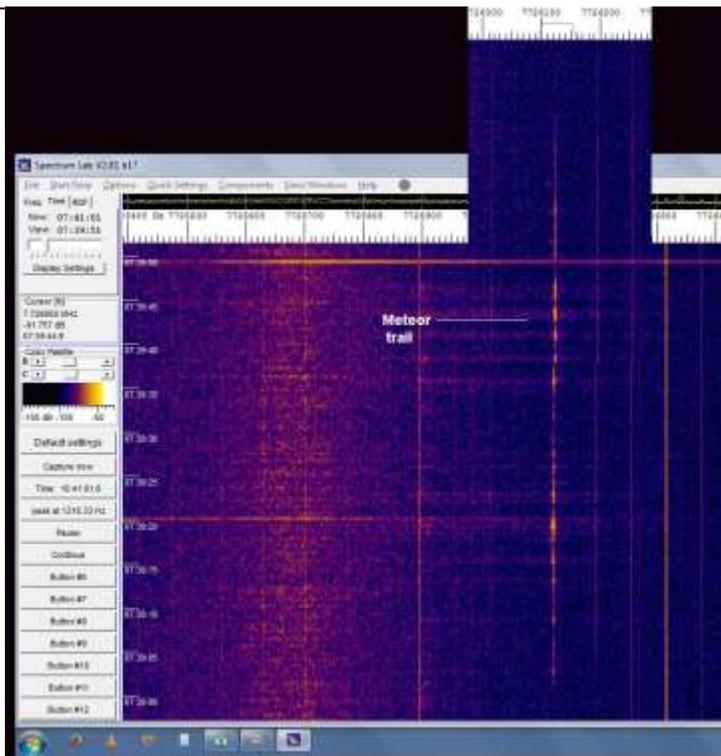
OK, you bought a used amateur radio with the mentioned features and you are ready to listen to meteors... not yet...

The next item you need is an antenna. Gezzz... how much? well you can make a simple dipole type out of wire or even two old TV extendable rabbit ears type, or a long piece of coax cut to the length of the frequency you will be using. Note, the shorter the frequency the longer the antenna... but if you are in a small apartment and the long one will not be useable, it can be cut in half, or quarter.. thus the term, 1/2 and 1/4 wave. My dipole is a 1/4 wave with each element about 40 inches (100 cm) long. The dipole will have 2 elements, a director pointing towards the target transmitter, and a reflector. Both are separate and do not touch each other (see photo on previous page),

Some radio observers use the Yagi, it is more directional and at times can eliminate a bit more noise than the dipole. However, it is expensive and bigger so in this article I will assume we will use the dipole. Once you have the antenna connected to the radio you just point it towards the most populated area of transmissions. But, now we need a frequency to monitor.

Now, what frequency do I monitor? This depends on what transmitters are active in your area and a baseline of 1000 Km is maximum, that is why pointing to the most populated area of the country is recommended.

As you recall, 90% of the TV analogue transmitters died because of converting to digital TV but there are still a few



▲ Spectrum Lab output 1 (Photo: Michael Boschat)

active analogue transmitters about. Your problem is hitting a good one. You can also get digital frequency carriers and hear meteors, you just need to tune to one of their carrier frequencies, as listed below, 54.310, 60.310, 66.310, 76.310 or 82.310 MHz. Do experiment by setting the frequency off a bit, say tuning to 76.309 MHz or 76.311 MHz. It is best to experiment during one of the major meteor showers to get a good frequency and note that down for future reference.

The basic frequencies for you to try and detect meteors are below, this is from my personal tests and shows what I have heard. Note that the 2nd frequency is from Digital TV carriers; as you can see for me TV channels 5 and 6 are my best ones. That because I live in a city and I am overwhelmed by other TV and FM

stations. This means I need to use a notch filter to eliminate as much noise from them as possible while I monitor my frequencies.

Ch = channel, AN= Analogue, DIG = Digital. Frequencies are always in MHz

Ch	AN	DIG	NOTES
2	55.25	54.310	--- Nothing heard
3	61.25	60.310	--- Tone heard but no meteors
4	67.25	66.310	--- Tone on VC + meteors heard on 67.2511 MHz. None heard on 66.310 MHz
5	77.25	76.310	--- Better one so far. Tone heard and meteors on 77.2511 MHz. Also heard on 76.3101 MHz. As of Aug. 24, very hard tone and other frequencies seem to be there, decided to drop to 77.25085 MHz still pick up meteors but tone is still there but will see what happens. As of Aug.28 - turned dipole to about 320 degrees North magnetic, about 90 degree angle from tone, it reduced the noise OK and was able to get meteors. As of Aug. 29, moved to 77.25191 MHz, higher to get away from noise, meteors still seen and seem a bit brighter on reflections.
6	83.25	82.310	--- So far good, tone on 83.251 MHz and meteors. Also heard on 83.24 MHz. More on 82.3101 MHz.

You can do a Google search for FM stations in Canada and USA but let them be 500-1000 KM away from you. Also stay in the lower range FM, 87 MHz to 99 MHz, listen to the fre-

quency chosen to hear if other stations are walking over the frequency you picked. Keep trying till you can get clear static.

You can do one of two things now. With the radio on you turn the squelch off and listen to the static, when a meteor goes by you will hear a "PING" like some one hitting a tuning fork. Some meteors will make a hard "WHOMP" sound. The sound will last for 1/2 second up to 30-50 seconds.

The other method to hear and see them is to download a software program, the one I use is called Spectrum Lab. When downloading a program make sure it is compatible with your operating system, and read the installation instructions carefully.

Now that you are a radio meteor observer, you can send monthly reports to some places, these help in determining a meteor shower's progress. Sometimes you will get a lot the day before or after the main visual peak, plus a radio system can detect meteors to about 8th magnitude.

SITES OF INTEREST

The FCC list of what stations from channel 2-6 are active in Canada and USA:

- <http://transition.fcc.gov/fcc-bin/tvq?state=&call=&arn=&city=&chan=03&cha2=03&ser>
- <http://transition.fcc.gov/fcc-bin/tvq?state=&call=&arn=&city=&chan=04&cha2=04&ser>
- <http://transition.fcc.gov/fcc-bin/tvq?state=&call=&arn=&city=&chan=05&cha2=05&ser>
- <http://transition.fcc.gov/fcc-bin/tvq?state=&call=&arn=&city=&chan=06&cha2=06&ser>

RADIO METEOR OBSERVERS BULLETIN: a site to send your reports, with contact person: <http://visualmob.free.fr/>
Contact: Christian Steyaert—steyaert@vvs.be

SPECTRUM LAB

Introduction: <http://www.qsl.net/dl4yhf/spectra1.html>
Download: www.qsl.net/dl4yhf/speclab/install_speclab.zip

How to Use Your FM Radio to Detect Meteors
http://www.skyscan.ca/meteor_radio_detection.htm

ON YOUTUBE: type in: Meteor Scatter Using Over The Air DTV Pilot Signals

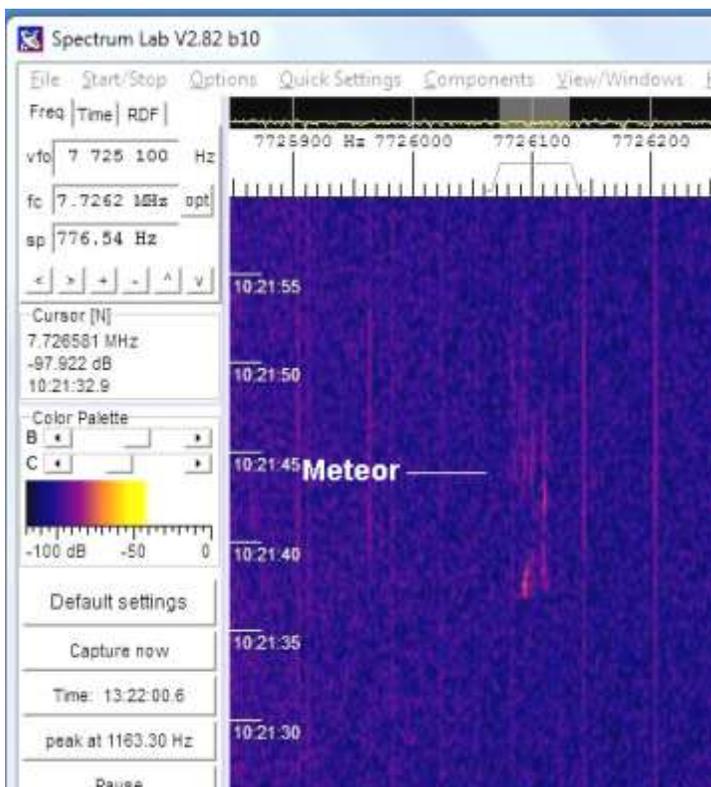
Amateur Dipole Antenna Calculator
<http://www.csgnetwork.com/antennaedcalc.html>

How To Build a 1/2 Wave Dipole
<http://www.wcerc.org/Projects/dipole.asp>

METEOR SHOWERS

Quadrantids Active January 1-10, peak January 3-4
Lyrids Active April 16-25, peak April 22-23

Eta Aquariids Active April 19-May 26, peak May 6-7
Delta Aquariids Active July 21-August 23, peak July 28-29
Alpha Capricornids Active July 11-August 10, peak July 27-28
Perseids Active July 13-August 26, peak August 12-13
Orionids Active October 4-November 14, peak October 21-22
Southern Taurids Active September 7-November 19, peak October 23-24
Northern Taurids Active October 19-December 10, peak November 11-12
Leonids Active November 5-30, peak November 17-18
Geminids Active December 4-16, peak December 13-14
Ursids Active December 17-23, peak December 21-22



▲ Spectrum Lab output 2 (Photo: Michael Boschat)

And in conclusion, one can always go to Youtube and type radio meteor and making a dipole antenna. There will be numerous videos on these subjects. And doing a Google search on the same above will yield lots of results with some plans and drawings on making a dipole. If you get gung ho type Yagi and try to make one of them also.

Clear skies and happy listening.....

Michael Boschat

Lunatic Ramblings 3 : Big and Small

Dave XVII Chapman

This issue, we review features visible around Q-day – 4, that is, about 4 nights *before* First Quarter. The Q-day system not only tells you *where* to look for an object, but *when best* to look, relative to the FQ date. Read the first couple of columns in this series to catch up on this system; if you want to know more, contact me and I'll give you all the material.

When the Moon is waxing, Q-day – 4 means the Moon is a young crescent, a bit challenging to observe in the autumn, as the ecliptic is below the equator in the west, and the Moon's altitude (in degrees) is low—therefore you need a low western horizon, and you need to get out in the twilight to observe the Moon before it sets.

The *Observer's Handbook* says the next FQ takes place on Thursday, November 19, at about 6 h UT (2 h AST), by which time the Moon will have set here. Counting back 4 days, we get to Sunday, November 15, but still at 2 in the morning. We have to observe the waxing crescent in the early evening, and the night of 14/15 may be too soon, so our best bet is to observe on the night of 15/16, when we should snag all the Q-day –4 objects in our list (and maybe a few Q-day –3 objects). Of course, the sensible way to observe the Moon is simply to notice

when it is above the horizon and clear, and then figure out what Q-day it is!

Lets get on with the features! North to south, their names are the craters Newcomb (39 km), Macrobius (64 km), and Taruntius (86 km); then Mare Fecunditatis; then the crater Cook (47 km); and the Rheita Valley (500 km x 30 km).

Newcomb is small, and a little underwhelming, located in a busy, heavily cratered, highland area of the Moon, northwest of Mare Crisium. It is included in our list because it is

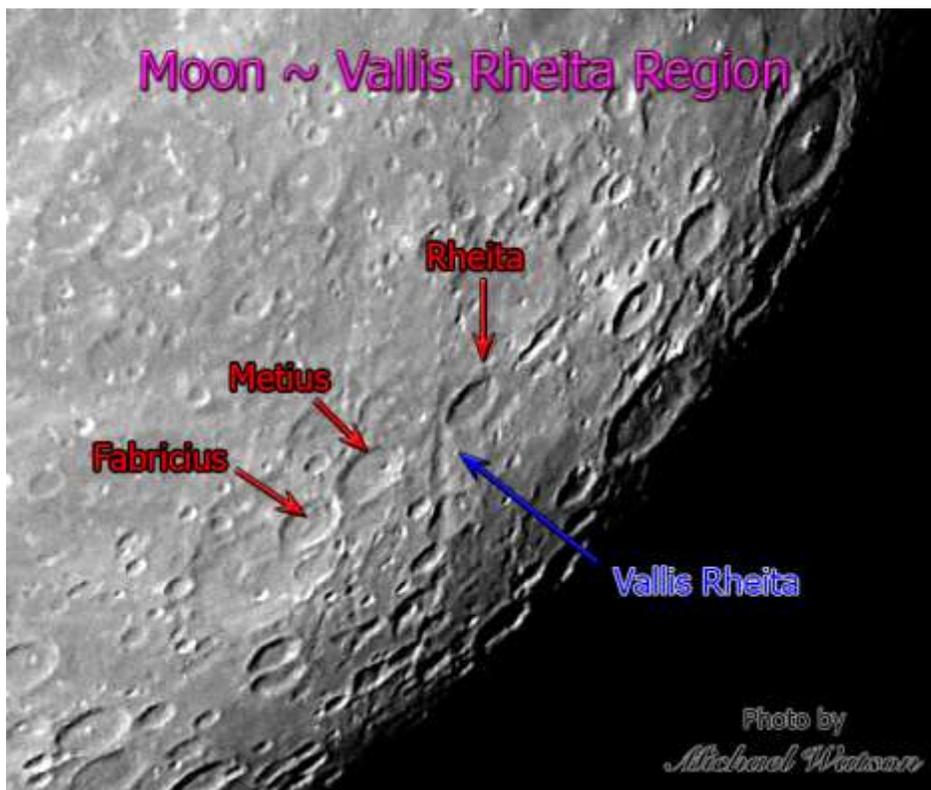
Fecunditatis.

Moving south, Mare Fecunditatis itself is a good-sized lava plain, with loads of craters around its rim, dorsa (ripples) in its surface, and flooded “ghost” craters that only show up with extremely oblique lighting just after lunar sunrise (or before sunset, two weeks later!). At the extreme southern part of the mare, on the west shore of a bay, lies the flooded, low-walled crater Cook, another “historical” crater named for James Cook (1728–1779), who spent a significant part of his adult life in Canada, mostly Halifax—you may need a good chart to identify it (e.g., Rukl Map 59). Finally, way down south, the Rheita Valley is actually more of a long crater chain (next to the crater Rheita) that may be connected with the impact origin of Mare Nectaris (now bisected by the terminator).

If you got this far, you deserve a treat: go way back up north—you can't have missed the almost-twin craters Atlas (87

km) and Hercules (69 km). You are getting an “early” look at some Q-day –3 features. That's just how things roll when you *Explore the Moon!*

That's enough for now—in my next column, we'll move on to Q-day –3 and look around. Email if you have questions or comments! dave.chapman@ns.sympatico.ca



▲ The Rheita Valley (Photo: Michael Watson)

named after the famous Nova-Scotia-born American astronomer Simon Newcomb (1835–1909). You may need a detailed chart to navigate to it (e.g., Rukl Map 25). Macrobius, on the way to Mare Crisium, is easier to find, a prominent, terraced crater. Moving southwest from Mare Crisium, Taruntius is larger still, with a central peak, near the top of Mare

Member Profile: Tim Doucette

Tony Schellinck

Tim Doucette is a community minded man of action. His job as a software developer for a consulting company allows him to work from home, so he moved back to his hometown of Quinan which is about 24 minute drive from Yarmouth in order to be near family and to pursue his passion of amateur astronomy.

In less than two years he has helped the community achieve the first Starlight Reserve and Tourist Destination in North America (www.Acadianskies.com) award by the Starlight Foundation (supported by UNESCO). He was first contacted by the Trout Point Lodge to assist with the project by consulting with the auditors from the Starlight Foundation. He has consulted with Yarmouth on how to reduce light pollution by changing the street lights, and is currently assisting the municipality of Argyle to establish bylaws to protect the dark skies of the re-

gion.

He has just completed the construction of an observatory and public outreach building on a site near his home (see photo) to start his astro tourism business.

Tim had ten years of experience conducting astronomy public outreach events when he lived in Moncton prior to moving back to Nova Scotia. All of these are remarkable achievements, but even more so when you consider that Tim was born totally blind and only received 10% of his eyesight back after surgery as a baby. As a teenager he was interested in the stars but felt that observing was beyond his reach. However, another surgery that widened his pupils and removed the lenses of his eyes improved his sensitivity to light. When he came back from surgery it was like a curtain had been lifted, he could see the Milky Way and stars.

His wife purchased an inexpensive scope and he could see Mars well enough, but wanted to see more. So he joined RASC Moncton and started viewing the sky with



▲ Tim Doucette at Nova East
(Photo: Tony Schellinck)

fellow members there. He discovered he could see more detail in the Ring Nebula (M57), as well as nebulosity among the stars that other observers could not see.

It turned out that the process of improving his vision gave him the ability to see ultraviolet light. He is so sensitive to it that black light can be painful and a bug lamp can illuminate an entire field for him. Inspired, he decided to pursue astronomy further. He purchased a 9 1/4 " Celestron with a CGE Mount and then discovered that, because his eyeballs are like cameras with the lens off, if he moves an eye to prime focus he can see through the scope without the need of an eyepiece. In the astronomy world, he has superpowers!

He enjoys astrophotography and public observing with RASC. His public outreach involves telling his own story, astrophotography and teaching people about the importance of astronomy. His situation and talents puts him in a unique position, such as when the CNIB sent a group of people interested in astronomy to meet with him. It turned out



▲ Tim Doucette's observatory and public outreach building in Quinan Nova Scotia is ready for guest observers. (Photo: Tim Doucette)

Member Profile: Tim Doucette Continued

Tony Schellinck

that one person who could only see black and white (i.e., high contrast), could see the craters on the moon quite well.

The observatory is scheduled to open in early November with a

dome 9' atop of a building designed to host 10-20 people who would attend a lecture prior to public viewing through his Celestron 14" scope. The dome can house 6-7 people at a time. In the spring he plans to expand the grounds to have an outdoor viewing area and larger Dobsonian telescope. His website is deepskyeye.com and I recommend a visit to see his progress in finishing this ambitious

project with the help of family and friends.

It was not luck that uncovered his super powers; it was his passion for astronomy that led to this remarkable discovery of his enhanced abilities. He wants people to not let their disabilities hinder them from pursuing their interests. I believe his achievements are an inspiration for us all.

Starlight and Semiconductors: What is a Picture Worth?

Art Cole

In February 1990, the space probe Voyager 1 had fulfilled its primary scientific mission, and had outlived its expected lifetime by ten years. At the request of the late astronomer Carl Sagan, Voyager 1 was turned back to face the Earth and its cameras were used to image our planet from the outer reaches of the Solar System. But it was not the first time Sagan had made the request. He originally suggested that NASA should take the image in 1980, but NASA was reluctant to do so over concerns that light from the Sun might damage the probe's cameras. Even in 1990, it took the intervention of NASA administrator Richard Truly to ensure that Sagan's request was fulfilled.

In the resulting image, the Earth appeared as a single blue pixel within the blackness of space, and consequently Sagan gave it the moniker Pale Blue Dot. As he predicted, the image had little scientific value, but in terms of philosophical value, it was priceless. In his book *Pale Blue Dot* Sagan wrote the following about his image:

Our posturings, our imagined self-importance, the delusion that we have some privileged position in the Universe, are challenged by this point of pale light. Our planet is a lonely speck in the great enveloping cosmic dark. In our obscurity, in all this vastness, there is no hint that help will come from elsewhere to save us from ourselves... It has been said that astronomy is a humbling and character-building experience. There is perhaps no

better demonstration of the folly of human conceits than this distant image of our tiny world. To me, it underscores our responsibility to deal more kindly with one another, and to preserve and cherish the pale blue dot, the only home we've ever known.

A similar story happened in 1995. It was shortly after the rescue mission to correct the Hubble Space Telescope's faulty optics, and public and government opinion of NASA was at its lowest level since the Challenger disaster. Bob Williams, the director of the Space Telescope Science Institute (STScI), wanted to point the Hubble at a blank area of sky for ten days in order to find out what, if anything, was there. Despite opposition from his colleagues, and at risk of further harming NASA's credibility, the imaging was carried out using his discretionary time on the telescope as the institute's director.

The gamble paid off. About 3,000 galaxies were captured in the image, over an incredibly tiny fraction of the sky. This single image (known as the Hubble Deep Field, or HDF) suggested that the Universe is awash in galaxies. Following the success of the HDF image, the Hubble has been similarly aimed at other areas of the sky, confirming that we are indeed surrounded by billions of galaxies. To get his thoughts on his original HDF image and what it means to him, I contacted Dr. Williams (coincidentally, on the night of his retirement as the director of STScI). He replied:

You ask, "...would you mind telling me how you feel about that image on a more esoteric level, especially as the person who oversaw its creation? Do you ever stare at it sometimes and just be amazed?" Well, the answer is: I still look at that image constantly. Love it and continue to be amazed by it and what it showed us! Yes,

the later UDF [Ultra Deep Field] with its higher resolution is a cleaner image, but I never fail, myself, to be touched deeply by the significance of the HDF image. A real life changer. It's wonderful. Connects humanity to the universe.

In both cases these men had the vision to know that the potential results were worth the risk. These two images, one taken through a camera pointing back towards the Earth and the other pointing away from it, show us just how tiny the Earth is in our vast Universe. At the same time, however, they give us pause to think about the uniqueness of humanity, urging us to treat each other and our planetary home with greater care and stewardship.

As amateur astronomers and astrophotographers, what can we take away from this? Perhaps the most important lesson to be learned is that we must constantly recognize the incredible wonders within our own images. As Sagan's and Williams' images show, the most poignant and amazing astrophotos are not necessarily the most colourful or the most beautiful. They are the ones that capture our imagination and make us feel something. From the blurriest cellphone photo of the Moon to the most advanced image humanity can muster, it is up to us to recognize the amazing spectacles that are presented to us, and to always view our images with a sense of awe and to feel joy through discovery.

Any questions? Contact me at art.cole@gmail.com.



▲ The left panel shows Carl Sagan's Pale Blue Dot image. The Earth is the single bright pixel to the right of centre, and is enlarged at lower left. Based on this image, Sagan referred to the Earth as "a mote of dust suspended in a sun-beam". The photograph was taken on February 14, 1990, by the *Voyager 1* space probe. The Satellite was about 6 billion kilometers (40.5 AU), from the Earth. The band of sunlight caused by the camera optics. (Photo: NASA)

▲ The right panel shows a part of the Hubble Deep Field photograph. Except for a handful of stars, all of the objects in this image are galaxies. The image was assembled from 342 separate exposures taken with the Space Telescope's Wide Field and Planetary Camera 2 over ten consecutive days between December 18 and December 28, 1995. (Photo: NASA).

September Meeting Report

Jim Millar

The meeting was called to order by President Paul Gray. There were 20 members present with one new member.



▲ The Eagle Nebula was a summertime target for Art Cole. (Photo: Art Cole)

Paul Gray informed the group that Dr. Alexi Fillipenko would be speaking at Saint Mary's on October 17th. It was decided to cancel the October regular meeting and that as many as possible would attend the lecture on the 17th. Paul Gray also mentioned that the RASC national website had been updated and that all should visit it.

It was announced at the national General Assembly that RASC had purchased Sky News. This is very good news and means that the publication will remain in Canadian hands and serve Canadian observers.

The theme for the meeting was "What did I do this Summer."

Tony Schellinck was the first speaker. He developed a program targeted toward new observers. He had a table set up with binoculars at several public outreach events where

he taught people to locate objects with the naked eye and then observe them with binoculars. It was well received. He also developed a flat screen planetarium show that he introduced at the Astor Theatre in Liverpool. It also went over well and could be made available for other small theatres in rural Nova Scotia.

Tony also spoke about the upcoming Hal-Con convention to be held October 30 to November 1. For Geek week he is giving two planetarium shows, October 28 and November 5, *Where in the Sky is the Klingon Empire?* He is also putting on a play, *The Night Sky According to Star Trek: Where Empires Exist* at Hal-Con October 31.

It was announced that we would have a table at Hal-Con. We get two passes with our table and it was decided to buy an extra day pass for the Friday and the Sunday to give us more volunteers.

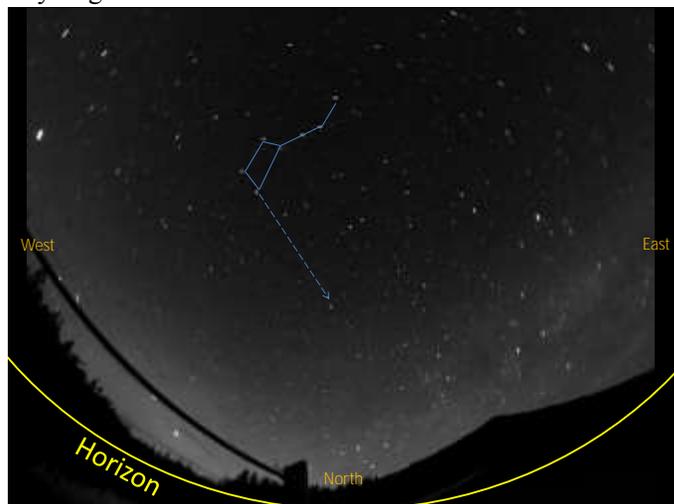
Paul Gray spoke next about his summer. He updated the membership on what happened at Nova East. We had clear skies and warm days for the full weekend. Photographer Alan Dyer was our guest speaker and he gave two excellent presentations. We also raised \$800 for the club through an auction.

Paul next spoke about his backcountry camping at Keji with his family. The skies were awesome and he had some great pictures. Paul is also the editor of the RASC Calendar. He has just completed the latest version and sent it to the printers. As if he wasn't busy enough, he also started work on his new backyard observatory.

Art Cole spoke next and showed us several of his new photos from the summer (see photo left). They were excellent.

Gerry Black was unable to attend in person but shared his time lapse videos that he took at the Keji Dark Sky Weekend and at Nova East. He is becoming very good at these.

Members were reminded that International Observe the Moon Night would be 19 October. Paul Heath was going to set up an observing session at Bishop's Landing. There were also going to be sessions in Lunenburg and Keji. Members talked about plans to observe the upcoming lunar eclipse on 27 September and the high tides a few days later. The meeting ended with Paul Gray presenting a slide show of the General Assembly.



▲ Tony Schellinck used time lapse photography to illustrate the movement of the stars on the big screen as a substitute for the planetarium dome in his Liverpool theatre flat screen planetarium presentation. (Photo: Tony Schellinck)